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AMERICAN JOURNAL OF PHARMACY

and

THE SCIENCES SUPPORTING PUBLIC HEALTH

SINCE 1825

DR. H. C. CHRISTENSEN

Retiring Secretary of the National Association of Boards of Pharmacy

NOVEMBER
1942

PHILADELPHIA

for Pharmacy and the Allied Health Sciences

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The situation with regard to the nation as a whole is described by the report that 23,000,000 persons in the United States had colds during the week ending February 24, 1942.[1]

1. Gallup, G.: American Institute of Public Opinion Survey, March 1, 1942
2. Gallup, G.: American Institute of Public Opinion Survey, Dec. 29, 1941

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OUR COVER

HENRY C. CHRISTENSEN

THIS journal is happy to dedicate its November issue to one who for 27 years has served the cause of pharmacy in such an important position as Secretary of the National Association of Boards of Pharmacy.

Dr. Christensen was born in 1865 at Union Grove, Wisconsin. He graduated in 1893 from the Northwestern University School of Pharmacy and then practiced retail pharmacy for 17 years. For a long time he served on the Illinois Board of Pharmacy and, becoming active in the Interstate Association of Boards of Pharmacy, he soon became the Secretary of the N. A. B. P. In this capacity Dr. Christensen has rendered a valuable service in coordinating the work of the many boards of pharmacy throughout the United States. He has worked with a quiet efficiency which has gained him both the esteem of his fellow workers and the highest honors in his chosen field. He was elected to the presidency of the American Pharmaceutical Association in which position he served for the year 1931. In 1938 the New York Branch of the American Pharmaceutical Association awarded him the Remington Medal and in 1923 he was awarded the degree of Ph. M. by the Philadelphia College of Pharmacy and Science.

Dr. Christensen, although now retired as the Secretary of N. A. B. P., still serves in an advisory capacity to his successor, Patrick H. Costello.

EDITORIAL

SCIENTIFIC AND PROFESSIONAL EDUCATION AND THE WAR

WITH the passage of the Act making all young men who have attained their eighteenth birthday subject to military service, a new problem arises in the field of scientific and professional education. Until this time most young men who were entered upon some program of scientific training were sufficiently advanced by the time they reached military age that their progress in college could serve as a basis for decision by their selective service board as to the advisability of deferment. Now, no enrollment in a course of advanced study seems possible unless some steps are taken to decide who shall and shall not be permitted to engage in scientific or technical study.

It is inconceivable that those in charge of the overall manpower problem fail to see the importance of continued technical education. The tremendous productive capacity of this country is in essence largely attributable to the very efficient educational program which for years has turned out technical and professional workers to man the large industries involved. Labor is an important factor in any plant but without its necessary complement of engineers, chemists and other technologists its production schedule would crack overnight.

The high level of public health enjoyed in America is due to the work of physicians, pharmacists, dentists and nurses, again the product of our educational system, and good evidence of its proper and efficient functioning.

With total war the need for such men and women with specialized training increases tremendously and already certain fields are experiencing a very great shortage of supply so much so that without government controls pirating of scientific workers and competitive bidding for services would be most flagrant. Even with existing controls there is a pronounced turnover of scientific personnel far too great for most efficient operation.

As our production goals and military needs rise this condition is certain to be worse. The post-war era will find us still faced with the same problem since consumer goods shortages the world over should create a demand far greater than anything ever experienced before.

These facts are well recognized as is the necessity for continued technical education to supply the scientific and professional workers of tomorrow. The real problem is how such educational work can be integrated with Selective Service in such a way that existing facilities are used and the division between students and soldiers is both equitable and democratic. It seems obvious that ability to pay for one's education should not, in time of war, be the deciding factor and this would indicate the necessity for government financing of all higher education.

The major problem is to what degree the educational process should be shortened. Already many schools have adopted an accelerated program as a wartime measure. The standard four-year course is given in continuous session in about three years. In this manner the same curriculum is presented as heretofore except no summer vacation period is allowed. This plan seems advisable under the emergency conditions of the present but those educators who have observed its functioning seem well agreed that as a permanent system it is quite inferior to the former less intensive process. The trouble lies in the fact that the rate at which one acquires knowledge cannot be accelerated beyond a certain point. It seems to be inseparably tied up with the process of maturation and this is a biological phenomenon not subject to alteration by the exigencies of the times. From certain quarters have come suggestions for all sorts of innovations calculated to complete the educational process in less than half the normal time, curtailing both high school and college training. Such suggestions overlook the inescapable fact that only time can make a man of a boy and a boy cannot successfully do a man's work. They further discard the careful pattern of higher education developed after years of study and planning by those responsible for scientific and professional curricula.

In planning the method by which wartime education shall continue those responsible for this difficult assignment should avoid two serious mistakes. First, the subject matter should not be greatly altered since one cannot in advance postulate the overall effect of the elimination of courses now integrated into a time-tested curriculum. Second, the time devoted to obtaining a sound technical or scientific training cannot be shortened beyond that minimum dictated by the limitations of flesh and blood. Men are not machines and to so consider them is to risk the complete breakdown of the entire educational effort. We must not in the press and urgency of winning a war forget that nothing can revoke the inexorable laws of nature. We need soundly trained specialists, let us be sure that our program is sound and that they shall be forthcoming.

L. F. Tice.

THE COMPARATIVE ACTIVITY OF POTENTILLA ANSERINA L. AND POTENTILLA ARGENTEA L. ON THE ISOLATED GUINEA PIG UTERUS*

By H. W. Youngken, Jr.,** and E. B. Fischer ***

HAUPSTEIN (1) and Schneider and Nevinny (2) have reported in the literature that decoctions of *Potentilla Anserina* L. were found to produce a uterine stimulant action upon the isolated uterus of various laboratory test animals. They reported also that these same decoctions exerted a combination anti-spasmodic activity by releasing an artificially induced barium spasm. Haupstein (1) and Bliss (3) employed extracts of *P. Anserina* L. in clinical cases of essential dysmenorrhea and both workers reported that a complete relief of pain was obtained by some patients and a partial relief by others following oral administration. Bliss (3) has reported that *P. Anserina* L. has been frequently found in the drug markets of the United States spuriously mixed with *P. argentea* L. Reports in the literature on the uterine action of preparations of *P. argentea* L. are wanting. It has seemed fitting, therefore, in view of the above recent findings to compare the activity of several extracts and decoctions from the two drug plants upon the isolated guinea pig uterus.

Materials and Methods

Guinea pigs weighing from 200 grams to 210 grams were killed by cervical blows and bled by incisions of the neck veins and arteries. Immediately the entire uterus was removed from the body and placed in a Tyrode solution as modified by Van Dyke and Hastings (5). The Tyrode solution measured up to 100 cc. in volume and was kept at a temperature of 38 degrees centigrade at all times. Sufficient amounts of oxygen were bubbled through the solution during the testing and suspension of the uterine strips. As it is generally found in biological assaying that no two pairs of uterine segments react exactly alike, Lignon (6) and others, variations and failures in normal

*Abstract of Part II of thesis presented to Graduate School, University of Minnesota, in partial fulfillment of the degree, Ph. D., June, 1942.

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***Professor of Pharmacognosy, College of Pharmacy, University of Minnesota, Minneapolis, Minn.

uterine responses were observed as expected. Of 13 guinea pigs used in the experiments 9 uteri were active in response whereas 4 failed to show a good response. From the 9 active uteri a total of 18 active horns were employed. Following the administration of each plant preparation each uterine strip was thoroughly washed with 200 cc. of warm Tyrode solution and allowed to rest for a period of not less than six minutes before continuing with the next test.

In testing the comparative activity of *Potentilla Anserina* L. and *P. argentea* L. on isolated uterine strips the following preparations made from the entire portions of each species were used in concentrations of 1:1000 : 10 per cent. decoctions, 10 per cent. infusions, 10 per cent. tinctures (70 per cent. alcoholic menstruum) fluidextracts and the following continuous extraction preparations, petroleum ether extracts, 95 per cent. ethyl alcoholic extracts, chloroform extracts and ethyl acetate extracts. The powdered drug in the case of each plant was removed from the extract during the extraction process and thoroughly air dried before continuing with each successive solvent. As much as possible of the dried extract from each solvent with taken up in 70 per cent. ethyl alcohol and used as such in the smooth muscle chamber in concentrations of 1:1000 so that a more uniform comparison with the tincture and fluidextract preparations could be ascertained. That portion of these continuous extraction extractives not soluble in 70 per cent. alcohol was not used.

The following preparations were used to artificially induce uterine spasms in the isolated guinea pig uterus: barium chloride a standard U. S. P. XI (65) solution of ergotoxine ethanesulfonate in 1 per cent. tartaric acid, and a 10 per cent. freshly prepared tincture of ergot.

Experimental

Two types of physiological activity were compared, the uterine stimulant activity and an antispasmodic activity. The latter was looked for following an induced muscle spasm. Of the 226 individual tests performed to produce a uterine stimulation 140 were made with *P. Anserina* L. preparations and 86 with *P. argentea* L. preparations. Decoctions, infusions, petroleum ether, and alcoholic extracts in a 1:1000 concentration produced a noticeable uterine stimulant effect upon the isolated uterus muscle. In general, the rate or tonicity excursions was increased rapidly following the administration of concentrations of these preparations and in many cases there was

a mild prolongation of amplitude of uterine contraction. Of these the greatest activity was observed with decoctions and ethyl alcohol extracts. Decoctions produced the most favorable activity. The 95 per cent. alcohol extracts of the continuous extraction procedure exerted more activity than did equal concentrations of a 10 per cent. tincture. The chloroform extractive of both plants produced the least stimulation response.

The above preparations of *P. Anserina* L. produced a more marked increase in the amplitude of uterine muscular contraction than did similar preparations of *P. argentea* L. The rate of tonicity excursions for both drug plant preparations was found to be about equal.

Several individual tests were made to produce a spasm release with preparations of both plants in order to confirm the findings of Schneider and Nevinny (3) and to compare the activity of each drug plant on this basis. However, all preparations of *P. Anserina* L. and *P. argentea* L. used in an attempt to release barium spasms which were produced by barium concentrations of 1:5000, 1:8000, 1:10,000, and 1:50,000 failed to show any marked antispasmodic activity. Contrary to the report of Schneider and Nevinny, decoctions of *P. Anserina* L. in concentrations of 1:1000 tended to retard a normal spasm release following the induced barium spasm of 1:5000 concentration. The same results were observed following the use of barium in concentrations of 1:8000, 1:10,000, and 1:50,000 to induce the muscle spasm. During such a retarded release of the normal barium spasm, there was an increase of muscle tonicity following the administration of *Potentilla* preparations. The degree of this increased tone was observed to be slightly better following the use of *P. Anserina* L. than following the use of *P. argentea* L. preparations of the same concentrations.

In experiments performed using a standard U. S. P. XI solution of ergotoxine ethanesulfonate in 1 per cent. tartaric acid to induce a spastic uterus contraction it was found that such a spasm could be produced conveniently by a concentration of 0.5 cc. of solution in 99.5 cc. of fresh Tyrode solution. This spasm lasted generally for from 2 to 3 minutes after which period it would normally release itself. When released the muscle would return quickly to a normal state followed by a short spastic contraction at the end of 7 or 8 minutes. No marked tone contractions were observed in the interim period between normal spastic release and the spontaneous second contraction of the muscle. The activity of *P. Anserina* L. and *P.*

argentea L. decoctions and 95 per cent. alcohol extracts of 1:1000 concentrations was measured against this type of ergotoxine contraction. It was found that preparations so used failed to release the spasm before it normally would release itself. Following the use of *Potentilla* extracts the normal ergotoxine spasm release was definitely delayed and always accompanied by an increase in muscle tone. Generally this tonicity increase was greater following the use of *P. Anserina* L. preparations.

Finally, experiments were devised using preparations of the two *Potentilla* species to release a uterine muscle spasm induced by a 1:2000 concentration of tincture of ergot. The results of these tests showed activity similar to that already noted following an induced ergotoxine ethanesulfonate spasm. In each case the normal spasm release was retarded following the use of *Potentilla* preparations. There was present also an increase in the rate and amplitude of muscle tone with the administration of *Potentilla* extracts as soon as the ergot spasm showed signs of releasing itself.

Summary

The uterine stimulant activity previously reported by other workers following the use of decoctions of *Potentilla Anserina* L. on the isolated guinea pig uterus has been confirmed.

The activity of the related species, *P. argentea* L., has been compared with that of *P. Anserina* L. following the use of decoctions, infusions, and several extracts on the isolated guinea pig uterus. Such preparations of *P. argentea* L. produced a tonicity increase similar to that produced by *P. Anserina* L. but in general with the rate and amplitude of muscular contractions less than that produced by *P. Anserina* L. preparations.

In an attempt to release a uterine spastic contraction which had been artificially induced by barium chloride, ergotoxine ethanesulfonate, and tincture of ergot in varying concentrations, preparations of both *Potentilla* species used failed to show any marked antispasmodic action. A normal spasm release was observed to be definitely retarded following the use of *Potentilla Anserina* L. and *P. argentea* L. The tone contractions, however, during the release were notably increased.

The antispasmodic activity which other workers have reported to accompany a mild uterine stimulant activity following the use of

P. Anserina L. preparations on the isolated uterus muscle could not, therefore, be confirmed. Phytochemical investigations of the constituents of both species are now being undertaken.

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PHARMACOPŒIAL NOTE

Maximum Package sizes Announced for Certain U. S. P. Products

IN an announcement dated November 15, 1942, the United States Pharmacopœial Revision Committee has limited the maximum size package permitted for four U. S. P. XII substances. This was done because these products deteriorate rapidly and, furthermore, are but infrequently called for. The drugs and their maximum size follows:

Apomorphine Hydrochloride—Maximum package size, 0.35 Gm.

Paraldehyde—Maximum package size, 120 Gm.

Physostigmine Salicylate—Maximum package size, 1 Gm.

Sulfurated Potash—Maximum package size, 120 Gm.

AN ANALYSIS OF WHITE BREADS, AND RELATED OBSERVATIONS *

By William Allen Sieber [1]

THIS project was undertaken to determine the chemical composition of twenty loaves of white bread sold on the Philadelphia market. The results obtained are compared with the analyses of white bread afforded by standard works on food inspection and nutrition. The analytical procedure, as well as the significance of each item of the analysis, is briefly discussed. The results are further employed in an attempt to approximate the amounts of shortening and milk solids specified in the recipe according to which each loaf was made.

Discussion of Methods of Analysis

The methods employed for sampling and for the usual items of bread analysis, viz., moisture, ash, protein, fat and crude fiber, were those designated as "Official" in the A. O. A. C. "Methods of Analysis," fifth edition, pp. 228-231 (1).

Preparation of Samples

One-half of each loaf, immediately upon removal of the wrapper, was weighed (accuracy of 0.1 gram), and the slices were broken into pieces about one inch square, which were then placed on a pan to air-dry. When these pieces were sufficiently crisp and brittle, they were crushed with a rolling pin and ground to 20-mesh fineness in a coffee mill. The dried crumbs were weighed, thoroughly mixed, and stored in air-tight containers. The remaining half of each loaf was retained for lactose and butterfat determinations.

Determination of Moisture

The A. O. A. C. specifies two optional methods for the determination of moisture: a vacuum oven procedure, in which two grams of the sample are dried at 98-100° for about five hours in a vacuum equivalent to 25 mm. or less of mercury; and an air-oven method, in which two grams of the sample (dried crumbs) are heated for ex-

*A thesis submitted to the Faculty of the Philadelphia College of Pharmacy and Science, in partial fulfillment of the requirements for the degree of Bachelor of Science in Chemistry, May, 1941.

[1] Chemist, Freihofer Baking Company, Philadelphia, Pa.

actly one hour at 130° (±3°) in an aluminum dish provided with a cover. The A. O. A. C. alleges that the latter method affords results that closely approximate those obtained by the vacuum oven method; indeed, the "one hour at 130° procedure" is often termed the "vacuum oven modification method" in cereal laboratories.

The air-oven method was employed in all of the moisture determinations made in this investigation. It was noted that the crumbs exhibited an appreciable darkening after having been heated, indicating a partial decomposition of the carbohydrate matter present.

The results of the air-oven procedure were compared, in a few cases, to those obtained by use of the classical water-oven method (heating to constant weight at 100°) and by distillation with toluene in a Bidwell-Sterling apparatus (A. O. A. C., p. 353). Typical results on the same sample were:

1 hour at 130°	5.96%	moisture
5 hours at 100°	5.28%	"
Distillation with toluene	5.20%	"

Thus it would seem that there is a considerable decomposition of carbohydrates when heating is conducted at 130°. But when it is considered that a vacuum oven heated at 100°, or even less, affords results that are in excess of those obtained by drying at 100° at atmospheric pressure for a like period of time, it becomes apparent that any decomposition of carbohydrate material at 130° for the one hour period is probably compensated for by a retention of a minute quantity of moisture. The method is, in a sense, empirical, but it affords reproducible results and is definitely time-saving.

The moisture in the original loaves was calculated in the following manner. To the moisture loss incurred during air-drying was added the amount of moisture present in the entire weight of dried crumbs. This sum represents the total moisture in the original sample of bread. The percentage of moisture in the original half-loaf was:

$$\% \text{ Moisture} = \frac{100B + C \times D}{A},$$

where A = weight of original half-loaf
B = loss of weight during air-drying
C = weight of air-dried crumbs
D = % moisture in air-dried crumbs

The results of the moisture determinations are recorded in Table I.

TABLE I

ANALYSIS OF LOAVES (AS RECEIVED)

Sample No.	Type of Loaf	% Moisture	% Ash	% Protein (Nx6.25)	% Fat (By Acid Hydrolysis)	% Crude Fibre	% Carbohydrate* (By diff.)
1	Pan	36.6	2.32	9.40	3.76	0.32	47.6
2	"	35.7	1.76	9.69	3.94	0.34	48.6
3	"	30.1	1.92	11.91	4.03	0.39	51.7
4	"	30.9	1.90	11.80	4.04	0.37	51.0
5	French	30.5	1.67	9.27	3.37	0.40	54.8
6	Pan	35.6	1.82	10.52	3.06	0.30	48.7
7	"	35.3	1.89	9.80	3.56	0.34	49.1
8	"	35.8	1.78	9.13	3.63	0.35	49.3
9	"	34.2	1.64	10.18	3.96	0.37	49.6
10	"	35.8	1.59	10.10	3.80	0.37	48.4
11	"	33.9	1.95	11.19	4.08	0.40	48.5
12	Italian	28.7	2.00	11.14	1.27	0.44	56.5
13	Pan	35.7	1.92	10.99	3.89	0.39	47.1
14	"	34.6	1.95	11.20	3.99	0.39	47.9
15	"	29.6	2.06	11.79	4.44	0.42	51.7
16	"	33.9	2.09	11.46	3.25	0.36	48.9
17	"	32.7	2.11	11.56	3.27	0.37	50.0
18	"	34.5	2.16	10.58	4.56	0.39	47.8
19	"	35.4	2.12	10.50	4.60	0.37	47.0
20	"	36.2	1.98	10.07	3.96	0.33	47.5
Average		33.78	1.93	10.61	3.72	0.37	49.6

*Nitrogen-free extract.

Determination of Ash

Five grams of crumbs are weighed into a fused silica ashing dish and incinerated at 550° in a muffle furnace until a light gray ash results. The procedure must not be prolonged, as excessive loss, through volatilization, of sodium chloride is caused thereby. Even if the incineration is conducted at minimum temperature for a short period of time (to dark gray ash) there is a considerable loss of chlorine. The writer has found that only about 75% of the total chloride content of the crumbs is recovered in the ash. Bailey (2) explains this loss on the basis that proteins, upon ignition, evolve ammonia, which reacts with the NaCl present to form NaOH and ammonium chloride. The NaOH is subsequently converted into

sodium carbonate, while the ammonium chloride is volatilized, resulting in a net loss of chlorine. The A. O. A. C. (p. 235) prescribes a method of determining chlorides in the ash, involving solution in dilute nitric acid, filtration, and determination of chlorides either gravimetrically or volumetrically. It is stated parenthetically that the NaCl value thus obtained, when deducted from the total ash, does not give NaCl-free ash. This is true because of the presence of the sodium carbonate formed from some of the NaCl.

The writer, having occasion to determine the NaCl content of a loaf of bread, developed the following method, adapted from the work of Bernardini and Gauthier (3). Ten grams of moisture-free crumbs are extracted with absolute methanol for 48 hours in a Sohxlet apparatus. Sodium chloride is only very slightly soluble in methanol, but the rigorous extraction removes practically all of that salt from the crumbs. The methanol is evaporated, the NaCl taken up with water and determined by a Mohr titration. The methanol does not dissolve any other salts, such as phosphates, which would interfere with a Mohr titration.

An aqueous extract of the crumbs would contain interfering ions, which would require acidification with nitric acid and the Volhard procedure. The acid would precipitate soluble protein matter which is extremely difficult to remove by filtration.

The ash of bread is derived from the salt (NaCl) added to the dough (about 2 lb. per 100 lb. of flour) and from the mineral matter of the milk solids, flour, malt extract, yeast, yeast food and the so-called "bread improvers."

Ash, and indeed all of the items of the analysis, are calculated in the following manner:

$$\% \text{ Ash} = \frac{\% \text{ of ash in crumbs x weight of dried crumbs}}{\text{weight of original half-loaf}}$$

This value is converted to "dry basis" by this procedure:

$$\% \text{ Ash} = \frac{\% \text{ ash (as received) x } 100}{100 - \% \text{ moisture content of half loaf}}$$

The results of the ash determinations are reported in Table I. In Table II these results are converted to "dry basis."

TABLE II

ANALYSIS OF LOAVES (DRY BASIS)

Sample No.	Type of Loaf	% Ash	% Protein (Nx6.25)	% Fat (By Acid Hydrolysis)	% Crude Fibre	% Carbo-hydrates*
1	Pan	3.67	14.82	5.94	0.50	75.07
2	"	2.74	15.04	6.12	0.53	75.57
3	"	2.75	17.06	5.77	0.56	73.86
4	"	2.75	17.08	5.84	0.53	73.80
5	French	2.41	13.34	4.85	0.57	78.83
6	Pan	2.83	16.38	4.76	0.47	75.56
7	"	2.92	15.11	5.51	0.52	75.94
8	"	2.77	14.21	5.50	0.54	76.98
9	"	2.49	15.46	6.02	0.56	75.47
10	"	2.48	15.74	5.93	0.57	75.28
11	"	2.96	16.91	6.17	0.61	73.35
12	Italian	2.81	15.63	1.78	0.61	79.17
13	Pan	2.99	17.10	6.05	0.60	73.26
14	"	2.98	17.12	6.11	0.59	73.20
15	"	2.93	16.79	6.31	0.59	73.38
16	"	3.16	17.32	4.91	0.54	74.07
17	"	3.14	17.20	4.87	0.54	74.25
18	"	3.30	16.12	6.94	0.59	73.05
19	"	3.26	16.21	7.11	0.57	72.85
20	"	3.10	15.78	6.21	0.52	74.39
Average		2.92	16.02	5.63	0.55	74.88

*Nitrogen-free extract.

Determination of Protein

About two grams of crumbs are digested with ten grams of anhydrous sodium sulfate, 0.7 gram yellow mercuric oxide, and 25 ml. of concentrated sulfuric acid. Digestion is continued for twenty minutes after the mixture becomes colorless. The mercury is precipitated by sodium thiosulfate, which is added with the caustic soda before distillation into standard alkali. This procedure is essentially the Kjeldahl-Gunning-Arnold method (A. O. A. C., p. 26).

The A. O. A. C. directs that the protein of bread be expressed as N x 5.7, the customary factor for wheat and wheat flour. But, as all the bread analyses in the literature indicate protein as N x 6.25 (if N is mentioned at all), the writer has adopted the latter practice. In view of the fact that modern bread contains increased amounts of milk solids, where protein is N x 6.38, the use of N x 6.25 is partly justi-

fied. However, some of the nitrogen of bread is ammoniacal, derived from the ammonium salts present in the yeast foods which most bakers employ.

The results of the protein determinations appear in Tables I and II.

Determination of Fat (by acid hydrolysis).

Fat in bread cannot be determined by extraction with ether in a Sohxlet apparatus. However long that process may be continued, a great deal of the fat remains unextracted, being retained by the large amount of carbohydrate material present. The writer has found that results thus obtained are as much as 50% in error.

The fat retention of the carbohydrates can be eliminated by hydrolysis with hydrochloric acid. The A. O. A. C. method (p. 213) consists essentially of the digestion of about two grams of crumbs with 10 ml. of HCl (25:11) for thirty or forty minutes in a 50-ml. beaker placed in a bath held at 70-80°. Ten ml. of 95% alcohol are then added, and the mixture is extracted three times with equal volumes of ethyl and petroleum ethers in a Rohrig tube, an adequate settling period being allowed after each extraction. The ethereal solution is evaporated in a tared 125-ml. beaker flask, which is then heated to constant weight (about two hours). The writer prefers a 250-ml. flask, which eliminates the possibility of the loss of fat by the "creeping" of the ethereal solution onto the exterior of the vessel.

The writer has found that best results are obtained with bread if the temperature of the bath does not exceed 70° and if the period of hydrolysis is reduced to twenty-five minutes. In this way a lesser amount of non-fat material is extracted. Mitchell (4) reported that at a temperature of 71-74°, ether-extracted starch gave 0.10-0.15% of extract which was actually non-fat material. As a consequence, it is apparent that a minute quantity of non-fat matter will be included in the extract to be weighed. For this reason, Munsey (5) recommended that the results of this method be designated as "fat by acid hydrolysis."

The results of the fat determinations are reported in Tables I and II.

Determination of Crude Fiber

Three grams of dried crumbs are extracted on a filter paper with three successive 15-ml. portions of ether (6) and then subjected to

the Official method for crude fiber of the A. O. A. C. (p. 358). The writer employs an alundum crucible for the final filtration. As this determination is entirely empirical in nature, the procedure as outlined must be rigidly adhered to if concordant results are to be obtained.

Determination of Carbohydrates

Carbohydrates, in bread analyses, are invariably determined "by difference," and the writer has adopted this practice. The A. O. A. C. refers to a tentative method for sugars (pp. 231-358); in "Cereal Laboratory Methods" (6) there is no reference at all to the analysis of any carbohydrate material in bread.

The writer employs the following method for sugars, dextrin and soluble starch. Twenty-five grams of crumbs are digested in 200 ml. of water at 50° for three hours, after which the mixture is centrifuged, the resulting liquid portion being added to a 500-ml. volumetric flask. The residue is washed five times with 50-ml. portions of warm water; each time the mixture is centrifuged, the liquid portions being added to the original extract. Five ml. of saturated lead subacetate solution are added, and the mixture is made up to volume and filtered. A few crystals of anhydrous potassium oxalate are then added to precipitate the lead. The solution is again filtered. Reducing sugars are determined in 50 ml. of the filtrate by the Munson and Walker method. The results are calculated to invert sugar and also to dextrose. This procedure for determining sugars in the aqueous bread extract is identical with that employed by Griffin (7) in the analysis of British gum. This is also true of the determination of dextrin that follows.

To 100 ml. of the lead-free solution prepared above are added 20 ml. of HCl (1:1) and 100 ml. of water. The mixture is heated in a boiling water bath for two and a half hours, after which it is cooled, nearly neutralized to litmus with NaOH solution, and made up to 500 ml. Fifty ml. of this solution (representing 0.5 gram of original sample are then analyzed for reducing sugars by the Munson and Walker method. The result is calculated to dextrose only. The difference between the percentages of dextrose before and after hydrolysis multiplied by 0.9 equals the percentage of dextrin (and soluble starch).

Although added to most bread doughs, sucrose is never present in the bread itself, the invertase of the yeast causing inversion during the fermentation period.

Starch is determined as directed by Leach (8) for direct acid conversion. Since there are practically no insoluble carbohydrates other than starch present after treatment with weak alcohol and strong alcohol, the method is sufficiently accurate. Three grams of the crumbs are washed with 50 ml. of ether, 150 ml. of 10% alcohol, and then with 95% alcohol. The residue is mixed with 200 ml. of water and 20 ml. of HCl (sp. gr. 1.12) and is refluxed for two hours, after which it is cooled, neutralized with NaOH solution, and made up to 500 ml. After filtration, 50 ml. of the solution (representing 0.3 gram sample) are analyzed for reducing sugars by the Munson and Walker method. The results are calculated to dextrose, which, when multiplied by 0.9, equals the percentage of starch. The writer has checked this procedure against a diastase method (using Fleischmann's Diastofor) and has obtained results which checked reasonably well.

Loaf No. 1 (see Table I) contained 47.6% carbohydrates by the method of difference. When its crumbs were subjected to the above procedures for invert sugar, dextrin and starch, the following results were obtained:

Reducing Sugars (as Invert Sugar)	5.1%
Dextrin and Soluble Starch	2.9%
Starch	38.6%
Carbohydrates (Total)	46.6%

If the reducing sugars were separated by fermentation with yeast, leaving the lactose of the milk solids unaffected, the combined invert sugar and lactose contents would largely compensate for the 1% discrepancy between carbohydrates "by difference" and "by analysis." According to Munson and Walker's table, lactose has only about two-thirds the reducing power of an equal weight of invert sugar. Bread also contains some maltose and dextrose.

Comparison of Average Analysis of Philadelphia Bread With Analyses From Various Sources.

Table III indicates that the Philadelphia loaves analyzed by the writer contain on the average considerably more mineral matter, pro-

tein and fat than do any of the loaves whose compositions were published in the literature cited.

TABLE III

COMPARISON OF AVERAGE ANALYSIS OF 20 PHILADELPHIA WHITE BREADS WITH ANALYSES FROM VARIOUS SOURCES

Reference	Designation of Loaf	% Moisture	% Ash	% Protein	% Fat	% Crude Fibre	% Carbohydrates
Phila. Av.	White Bread	33.8	1.93	10.61	3.72	0.37	49.6
A	" "	—	—	9.2	1.3	—	53.1
B	White Milk	—	—	9.6	1.4	—	51.4
C	White Bread	35.6	1.2	9.3	1.2	0.5	52.7
D	Home-Made White	33.0	1.05	7.94	1.95	0.24	56.7
E	White Bread	—	—	9.6	1.4	—	51.1
F	" "	39.6	0.60	6.77	0.40	0.22	52.2
G	London Household	40.0	0.68	8.50	0.57	—	50.0
H	White Bread	35.3	1.1	9.2	1.3	—	53.1
I	" "	35.0	—	9.0	1.5	—	52.0
J	" "	34.7	1.2	9.2	1.3	0.5	53.1
K	" "	—	1.4	9.0	2.0	—	52.5

Key to References in Table III:

A—Sherman, H. C., "Chemistry of Food and Nutrition," p. 584, Fifth edition, The Macmillan Co. (1937).

B—Lange, N. A., "Handbook of Chemistry," p. 552, Third edition, Handbook Publishers, Sandusky, Ohio (1939).

C—Winton, A. L., "Structure and Composition of Foods," Vol. I, p. 245, John Wiley and Sons (1932).

D—Leach, A. E., "Food Inspection and Analysis," Fourth edition, p. 340, John Wiley and Sons (1931).

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F—Grant, J., "Chemistry of Bread Making," p. 170, Edward Arnold, London (1917).

G—Jago, W., and Jago, W., "Technology of Bread Making," American edition, p. 377, Bakers' Helper, Chicago (1921).

H—Hodgman, C. D., "Handbook of Chemistry and Physics," Twenty-first edition, p. 1041, Chemical Rubber Co., Cleveland, Ohio (1936).

I—Briscoe, H. T., "General Chemistry for Colleges," p. 715, Houghton Mifflin Co. (1935).

J—Nutritional Charts, H. J. Heinz Co., Pittsburgh, Pa. (1934).

K—Wihlfahrt, J. E., "A Treatise on Baking," p. 337, Standard Brands, Inc., New York (1934).

The increased use, in recent years, of larger amounts of skim milk solids, mineral yeast foods and salt is responsible for the greater amount of ash in the Philadelphia loaves.

The trend of the baking industry toward the use of added skim milk solids and, in some cases, of higher protein flours is reflected in the higher protein content of the loaves. It will be noted that the percentage of protein in the English breads, under F and G, is very low, due to the use of extremely low nitrogen flours and to the absence of milk solids.

While the baker of today is adding more fat to his doughs than he did a decade or two ago, the marked difference between the Philadelphia fat average and that of the sources quoted is probably due in most cases to faulty methods of fat determination in the latter instances. The writer believes that most of these fat figures were determined by the usual extraction in a Sohxlet apparatus.

The writer, in a search of the literature, did note two references to analyses that show added ash, protein and fat percentages in bread. One was a rather indefinite compilation of analytical data on bread by C. B. Morison (9); the other was a tabulation of the range of the analyses of many loaves formerly "accepted" by the American Medical Association (10).

Approximation of the Amount of Shortening Added Per Hundred Pounds of Flour

The ether extract is derived from the natural oil of the flour, the shortening employed, the fat used in greasing the pans (in pan bread), the fermentation trough grease and the liquid petrolatum dividing machine lubricant. The writer has found that, for pan bread as baked in the average shop, pan and trough grease and divider oil amount to about 0.3 lb. per 100 lb. of flour. The ether extract of the average patent flour (acid hydrolysis method) is about 1.4%. There is, apparently, sufficient oxidation of the fats during baking to bring the total fat, exclusive of that added as shortening, to 1.9 lb. per 100 lb. of flour.

The amount of fat added, therefore, can be calculated by means of the following formula, which has afforded the writer very satisfactory results.

$$\text{Lb. fat added per 100 lb. of flour} = 1.05(F - 1.9),$$

where F = percentage of fat on dry basis.

The quantity 1.05 is derived from the fact that about 105 lb. of anhydrous bread are obtained from 100 lb. of flour. In the cases of French and Italian breads, where the recipes are "lean," the figure is reduced to 0.96 and 0.91, respectively. And because these types of bread are not baked in pans, eliminating pan grease absorption and oxidation, the 1.9 subtracted from the percentage of fat on a dry basis is reduced to 1.75.

In order to check the accuracy of the above method of calculation, breads were baked with varying amounts of fat, which was then determined analytically in the finished product. The estimated amounts of added fat, compared with the known values, are given in the following table.

TABLE IV

Type of Loaf	Lb. fat added per 100 lb. flour	% Fat (dry basis)	Estimated added fat per 100 lb. flour (lb.)	Actual lb. of anhydrous bread obtained from 100 lb. flour*
Pan 1	none	1.87	none	101
" 2	1.00	2.89	1.04	102
" 3	3.00	4.73	2.97	104
" 4	5.00	6.61	4.95	106
French 1	1.00	2.82	1.03	95
" 2	3.00	4.81	2.94	97

*In these calculations, the factor 1.05 was used for all the pan loaves; 0.96 was used for the French loaves.

The estimated amounts of shortening added per 100 lb. of flour in each of the twenty Philadelphia loaves appear in Table VII.

Approximation of Amount of Butterfat Added Per 100 Pounds of Flour

For the estimation of butterfat the A. O. A. C. presents a method for "fat and fat number," which involves acid hydrolysis of 50 grams of dry crumbs, followed by absorption of the fat with filter cel at a low temperature. The filter cel is then dried and extracted with petroleum ether, upon the evaporation of which the fat is obtained quantitatively. One gram of this extracted fat is subjected to a modified Reichert-Meissl procedure, in which the titration is conducted with 0.02 N. NaOH. Since only a one-gram sample of fat is taken, the ml. of 0.02 N alkali x 1.1 is the same as a Reichert-Meissl value.

Because very few commercial loaves contain any butterfat, the writer determines fat quantitatively by the acid hydrolysis method described on page 427. If a butterfat determination is thought justifiable, a method described by Hoffman and his co-workers (11) is resorted to.

Three hundred grams of air-dried crumbs (including the unweighed half of the loaf) are boiled for one hour with 1000 ml. of water and 20 ml. of concentrated HCl. Ten grams of Celite (Johns-Manville) are added and the mixture is filtered through a Buchner funnel. Suction is continued until the mass is fairly dry. Then the residue is transferred to a beaker, stirred with ethyl ether (q. s.) and again filtered, through a layer of Celite, into a dry flask. The ether is evaporated and the extracted oil is dried at 100°. A standard Reichert-Meissl determination (A. O. A. C., p. 433) is run on a five gram sample.

The writer developed the following method of calculating the butterfat added per 100 lb. of flour. The non-butterfat portion of the ether extract is assumed to have a Reichert-Meissl number of unity; to butterfat is assigned the value of 28.0.

Let A = % butterfat in the loaf (dry basis)
B = % other fats in the loaf (dry basis)
C = % total fat in the loaf (dry basis)
R = Reichert-Meissl number of the extracted fat

Therefore, $A + B = C$

$$\frac{28A + B}{C} = R$$

Solving these simultaneous equations, we have

$$A = \frac{RC - C}{27}$$

The value of A, multiplied by 1.05, represents the butterfat added per 100 lb. of flour.

The efficacy of the above method was checked by baking four loaves of bread, the butterfat content of which was then determined analytically. The results are tabulated in Table V.

TABLE V

Sample No.	Lb. Fat (non-butterfat) added per 100 lb. of flour	Lb. Butterfat* added per 100 lb. of flour	Reichert-Meissl number of ext. fat	% Total Fat (Dry basis)	Estimated butterfat added per 100 lb. of flour
1	3.00	1.65	7.6	6.54	1.67
2	2.00	2.46	11.2	6.41	2.53
3	1.00	3.27	14.4	6.17	3.22
4	none	4.08	18.1	6.07	4.04

*Derived from butter containing 81% fat and 0.03 lb. butterfat contained in the milk powder employed.

Propionic acid, in the form of its calcium or sodium salt, is employed by some bakers in warm weather as a mold inhibitor. The fat extracted from bread containing this acid will exhibit a Reichert-Meissl number that may be as much as 0.5 in excess of 0.9, the value usually obtained for bread made without butterfat.

Approximation of Skim Milk Solids Added Per Hundred Pounds of Flour

The A. O. A. C. (p. 230) specifies a procedure in which the citric acid in bread is converted into pentabromacetone, from which can be calculated the percentage of skim milk solids present. But, as citric acid (calcium salt) is contained in milk in extremely small amounts, viz., 0.16% in liquid whole milk, and 1.81% in powdered skim milk, any error in analysis will be enormously magnified when milk solids are calculated.

The writer has had reasonable success with a biochemical method for skim solids reported by Hoffman and his co-workers (12), in which lactose is determined. Since fat-free milk solids contain almost exactly 50% of lactose monohydrate, their content can be accurately estimated. Lactose is not directly fermentable by yeast, thereby providing a method by which other sugars, such as dextrose, levulose and maltose, are removed by fermentation, leaving the lactose to be determined without interference.

In employing the Hoffman method, the crust is removed from several slices of bread, so as not to include any lactose which has been caramelized. When the slices are air-dried, they are ground

sufficiently so as to pass a 20-mesh sieve. Fifty grams of these crumbs are digested with 400 ml. of warm water for three hours, after which the mixture is centrifuged. The liquid portion is decanted into a liter volumetric flask, while the residue is shaken with 75 ml. of warm water and again centrifuged. This procedure is repeated three more times, the liquid portion always being added to the original extract in the liter flask. Thirty-five grams of compressed yeast are added, together with 0.5 gram ammonium sulfate and 0.2 gram sodium bisulfite (acting respectively as a yeast food and an agent to retard bacterial action).

Fermentation is allowed to proceed overnight. Then 20 ml. of Fehling's copper solution are added and sufficient NaOH solution is run in to produce a definite blue color, thereby effecting clarification. The solution is made up to volume in the liter flask, shaken, and filtered through paper. Lactose is determined in 50-ml. portions of the filtrate, using the Munson and Walker procedure. Fifty ml. of the filtrate are equivalent to 2.59 grams of bread after the correction is made for the volume occupied by the yeast.

The percentage of lactose (dry basis) x 2 x 1.05 equals the lb. of skim milk solids added per 100 lb. of flour.

The accuracy of the method was checked by analyzing loaves baked with varying known amounts of skim milk powder. The results are given in Table VI.

TABLE VI

Sample No.	Lb. skim milk solids actually added per 100 lb. of flour*	% Lactose (Dry basis)	Estimated added skim milk solids per 100 lb. of flour
1	0.96	0.49	1.03
2	1.92	0.95	1.99
3	2.88	1.33	2.80
4	3.84	1.77	3.72
5	4.80	2.35	4.94

*Derived from powdered skim milk containing 96% solids not fat.

As a further check on the butterfat and skim milk solids methods, a loaf of alleged "Milk Bread" was obtained from the Chicago mar-

ket. Milk bread is bread in which all of the liquid added to the flour in making the dough is whole milk or its equivalent in butterfat and skim solids. About 70 lb. of liquid whole milk are thus employed per 100 lb. of flour, representing about 2.5 lb. of butterfat and 6.2 lb. of skim solids. Analyzed according to the Hoffman methods, the loaf contained 2.62 lb. of butterfat and 6.05 lb. of skim solids per 100 lb. of flour, indicating the truth of the statement that the loaf was a Milk Loaf.

The estimated amounts of skim milk solids added per 100 lb. of flour in each of the twenty Philadelphia loaves appear in Table VII.

TABLE VII

APPROXIMATION OF AMOUNTS OF SHORTENING AND SKIM MILK SOLIDS ADDED PFR 100 LB. OF FLOUR

Sample No.	Type of Loaf	% Fat (Dry basis)	Approximate lbs. Fat added per 100 lb. of flour	% Lactose H_2O (Dry basis)	Approximate lbs. Skim Milk Solids added per 100 lb. of flour
1	Pan	5.94	4.2*	1.9	4.0
2	"	6.12	4.4**	1.4	3.0
3	"	5.77	4.0	1.9	4.0
4	"	5.84	4.1	1.9	4.0
5	French	4.85	3.0	1.1	2.1
6	Pan	4.76	3.0	2.6	5.5
7	"	5.51	3.8	1.9	4.0
8	"	5.50	3.8	1.9	4.0
9	"	6.02	4.3	0.8	1.7
10	"	5.93	4.2	0.8	1.7
11	"	6.17	4.4	1.8	3.8
12	Italian	1.78	none	none	none
13	Pan	6.05	4.3	1.8	3.8
14	"	6.11	4.4	1.7	3.6
15	"	6.31	4.6	1.8	3.8
16	"	4.91	3.1	1.2	2.5
17	"	4.87	3.1	1.2	2.5
18	"	6.94	5.2	1.9	4.0
19	"	7.11	5.4	1.9	4.0
20	"	6.21	4.5	1.9	4.0

*Includes 1.2 lb. butterfat.
**Includes 0.4 lb. butterfat.

Summary

1. The A. O. A. C. presents methods of bread analysis that are easily conducted and afford satisfactory results.

2. The practice of calculating the carbohydrate content of bread "by difference" is entirely justifiable.

3. Modern bread is richer in minerals, protein and fat than the bread of former times.

4. Authors of works on foods and nutrition should revise the figures they present on the composition of bread, because what is true of Philadelphia bread is true of American bread in general.

5. Analytical methods are available whereby the amounts of fat and milk solids in the recipe according to which a loaf was made can be approximated with reasonable accuracy.

Acknowledgment

The writer wishes to acknowledge his indebtedness to Dr. Arthur Osol for the latter's helpful suggestions in connection with this work, and to the Freihofer Baking Company, which furnished the facilities for the baking tests and analyses.

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(12) *Ibid., 8,* 298 (1936).

CURTAILED SCIENTIFIC PUBLICATIONS OF THE DEPARTMENT OF AGRICULTURE

By T. Swann Harding

THE publications issued by the Department of Agriculture will be seriously curtailed during this present fiscal year by considerable cuts in printing and binding funds. Yet in the past fiscal year members of Congress themselves distributed more than five million Farmers' Bulletins and Leaflets, more than 125,000 miscellaneous publications, and a grand total of 5,432,225.

The Department also issued a list of available Farmers' Bulletins and Leaflets for the convenience of members of Congress who wish to send publications to their constituents. Members are required to request these lists and during the fiscal year just ended they did request 3,170,000 of them.

During the past fiscal year also nearly 800,000 requests were received by the Department's Office of Information for information that could best be sent out in the form of publications, as well as for publications directly. Of these requests 222,000 came from offices of members of Congress.

The average request for such information can be answered with a printed publication for a fraction of a cent. The preparation of a special letter in reply would be always expensive, sometimes exorbitantly so.

A long-time historical tendency is involved here. For many years the public has looked to the Department of Agriculture for accurate scientific information on many subjects. Some citizens also write in the most detailed personal matter as if to a father confessor. This is traditional. Late in the year 1889 Secretary of Agriculture Jeremiah Rusk wrote that the Department has received nearly forty thousand letters asking for information between January 1 and October 1 that year. These letters, he said, came "from all sections of the country, from all classes and conditions."

It was Rusk who, on the insistence of Dr. W. O. Atwater, the famous nutrition worker, first fully realized the importance of Department publications, and of good press relations. He appointed George William Hill to supervise editing and publishing. He instituted the

Farmers' Bulletin series and a press service. He saw that bulletins containing information the Department had accumulated must be published promptly and in plain language. The Annual Reports were insufficient. Rusk's successor, J. Sterling Morton, established the Division of Publications.

Rusk was right. The Act founding the Department of Agriculture enjoined it "to acquire and *to diffuse* among the people of the United States useful information on subjects connected with agriculture in the most general and comprehensive sense of that word." The first Commissioner of Agriculture (the work then had a bureau status) Isaac Newton, set down as a primary objective of his Department in 1862, "the collection, arrangement, and publication of useful agricultural information."

Already, before the Department was founded in 1862, the Commissioner of Patents had been compelled by public insistence to publish annually a book full of agricultural information. But the first official agricultural publication in this country was Count Von Hazzi's Treatise on the Rearing of Silkworms which the Congress itself printed as a document in 1828. So Congress began all this publication.

The first publication issued by the new Department was on the Present Agricultural, Mineral, and Manufacturing Condition and Resources of the United States, by Commissioner Newton. The first research publication was by the Department chemist, Charles M. Wetherill and was a Report on the Chemical Analysis of Grapes. During the next 75 years Department workers published over eight thousand five hundred research papers in the field of chemistry alone.

Naturally this publication of scientific information in highly technical language has entailed publication of the same information in popular form. Whenever Congressional legislation has changed the functions and objectives of the Department the printed word has always been necessary as one means of acquainting farmers with the nature of these changes.

Passage of the Lend-Lease Act, and the setting aside of a billion and a half dollars to buy agricultural commodities for Great Britain and others of the United Nations is a case in point. All at once, after years of so-called "overproduction," surpluses, and glut, farmers had to be urged to increase production very considerably and, in many cases, of crops that we had never exported in our history.

Very soon war precipitated us into scarcities and shortages we had never known before, among them rubber. For a long time it had been the custom to hold farmers' meetings and to spread agricultural information by travel and personal contact. Now both agricultural agents and farmers were reluctant to use their cars, hence we became increasingly dependent on the radio and the printed word.

Fortunately the unit cost of influencing the adoption of new farm practices by means of publications is low. Bulletins also are very effective methods of doing this, both directly and indirectly. For while some farmers procure and read the publications themselves, and tell others of their success after following the practices recommended, others have long heeded the advice of professional workers who have read and digested the information in the publications.

At the same time publications of the Department have become important to the War and Navy Departments, the Red Cross, the Office of Civilian Defense, the Pan-American Union, State, city, and county boards of health and other institutions and agencies which draw upon them heavily. Many of the publications required are highly technical; others are popular. All do their part in winning the war.

Publications on nutrition, the properties of lumber, mildew-proofing fabrics, costs of living, the control of dangerous insects which cause disease or destroy property, methods of increasing food production or of assembling commodities for Lend-Lease shipment, climate and rainfall, the radio control of forest fires, all assume increased importance. Department publications have also proved of aid in locating industrial plants and military establishments, in effecting camouflage, in providing strategic and critical raw materials or their substitutes, and in assisting families adjust to a wartime economy.

At no time in its history have the publications of the Department of Agriculture been more sought after and more useful. They are helping to win the war and to aid farmers in achieving their 1942 agricultural production goals. Nearly three million copies of the Farmers' Bulletin on Home Canning of Fruits, Vegetables, and Meats have been called for by the American people since it appeared, while two and a half million copies of the one on Food For Children, and about two million each of those on Homemade Bread, Cake, and Pastry, Stain Removal from Fabrics: Home Methods, and House-Cleaning Management and Methods have been sent out on request.

These are very large circulations for publications of any kind and indicate a keen interest in conservative home management which is of great importance in wartime. In the neighborhood of a million copies each of Farmers' Bulletins dealing with Farm Poultry Raising, Fitting Dresses and Blouses, Diseases and Parasites of Poultry, the Feeding of Chickens, and the City Home Garden have been requested.

The 1942 farm-production goals set up by the Department of Agriculture for the guidance of farmers called for the greatest output ever chalked up by Americans farms. Greatly expanded production of milk, eggs, lard, pork, fat and oil crops, and peas and tomatoes for canning, especially, was required. There are direct indications that publications in most demand aided farmers in achieving these goals. They also helped workers everywhere become better nourished. Moreover, the production goal was not only achieved but surpassed.

For instance over 2,800,000 copies of Eat the Right Food to Help Keep You Fit have been requested since it appeared in January 1941, of which 669,600 were sold by the Superintendent of Documents. Since July 1, 1941, about one hundred and twenty thousand copies of Home Canning of Fruits, Vegetables, and Meats have been distributed and 30,344 copies, all told, have been sold since it first appeared. Ten thousand copies of a publication on Community Food Preservation Centers, issued in October 1941, have already been distributed.

Many Department publications have had a direct economic value that could be estimated in dollars and cents. Thus Marion Dorset's publications on the control of hog cholera have long been worth ten to twenty-five million dollars a year to the swine industry, depending on market and other conditions. Publications on foot-and-mouth disease, cattle tick fever, and the diseases of sugarcane and sugar beets may be said to have saved entire domestic industries from annihilation.

William Orton's first departmental publication, The Wilt Disease of Cotton and its Control, a Bulletin of the Division of Vegetable Physiology and Pathology, which appeared in 1900, is a classic instance. It actually forms the foundation for nearly all subsequent work on breeding lines of economically valuable crop plants of every kind which are genetically resistant to plant diseases. The ultimate value would run into millions just as would the value of David Fairchild's accounts of plant and fruit introductions into the United States.

Very recently a consultant of the Navy Department stated that the use of one Soil Survey issued by the Department of Agriculture resulted in a saving of $300,000 in the construction of a single airport. These Soil Surveys not only have an important agricultural use but more than 300 of them have been utilized by the War and Navy Establishments since our National Defense Program got under way and war followed.

The Department's publications form the very life of its functions. As Secretary Rusk remarked fifty years ago it is ill-advised for such a Government agency to keep secret the knowledge it secures or creates. "Time and expense, ability and experience, lavished on the work of this Department can have no practical results unless we can lay their conclusions promptly before the people who need them," he wrote.

In the past fiscal year something like $170,000 was expended for the publication of scientific and technical material and about $450-000 for the publication of popular material by the Department of Agriculture. Under the new Agricultural Appropriation Act at least $100,000 less will be available for both technical and popular publications than was expended last year on the latter alone.

Since the planning and regulation of the agricultural industry was so largely lodged in various Department agencies by different acts of Congress, job printing—the printing of forms, certificates, instruction pamphlets and so on—has increased stupendously. The Agricultural Adjustment Agency alone uses millions of forms. This publication is absolutely necessary and it absorbs in the neighborhood of $900,000 a year.

That means that the other Department publications must be curtailed to roughly one-half, at least insofar as the issuance of new material is concerned at this time of great national emergency. The Yearbook of Agriculture will not appear at all after the present 1942 book on animal diseases is issued. The Journal of Agricultural Research fortunately has its own appropriation and will appear as usual. But Farmers' Bulletins, Leaflets, Technical Bulletins, Circulars, Miscellaneous Publications, and so on will be cut at least half.

The Department of Agriculture is a research and an educational institution, as well as a planning agency. It has and constantly creates knowledge. To give this knowledge power it must be published. This was never more important than right now when publications too can help us achieve final victory.

THE STORY OF THE QUININE POOL

By John E. Kramer

Registrar, Philadelphia College of Pharmacy and Science

AFTER reading "The Diary of a War Nurse in Bataan," and remembering the tragic sentence, "Eighty-five of our nurses when evacuated from Bataan were suffering from malaria because there was no quinine to be had," it occurred to President Ivor Griffith, of the Philadelphia College of Pharmacy and Science, that American Pharmacy might do something to help overcome this serious shortage.

Java and other nearby islands had been the great quinine producing localities. Now the Japs own them temporarily, and thus control the world's quinine output. Some is still available from South America, but after the Dutch had made growing cinchona trees in the East Indies something of a science, the South American crop gradually lessened, and the alkaloidal output of the South American bark, for many reasons, would not come near that of the East Indian barks.

Thus, our stockpile of quinine and other alkaloids of cinchona is practically just that which we have in the country. The War Production Board, and preceding agencies had wisely piled up a good surplus of this important ammunition. It is called ammunition because in the malaria belt not much in the way of accomplishment can be done by human beings unless malaria is avoided, for its fever and its sequelæ are so enervating, that human endurance fails. Mosquito control, through drainage and oilage, mosquito repellants and other devices do help to keep it down, but the immediate scourge of malaria can only be truly combatted with quinine or with some other compound which can perform as quinine does.

Thus far, no compound has been found or synthesized which totally replaces the cinchona alkaloids in the treatment of malaria. Atabrin or atabrine has its advocates. So does plasmoquin or plasmochine. But it is not yet agreed that these synthetics have as much significance in the treatment of malaria as do the old established, natural cinchona alkaloids, and besides their production is still relatively low.

Anticipating demand, the War Production Board had frozen stocks of quinine exceeding fifty ounces, and it had immobilized quinine on druggists' shelves with the pronouncement that thereafter quinine, quinidine, cinchonine, and cinchonidine, and their salts, could only be used in civilian practice for the treatment of malaria. No longer could they be used in hair tonics, in ointments, in cold capsules, and similar concoctions.

Thus, open packages on the druggists' shelves were rendered practically static and useless. Early in September, accordingly, the Philadelphia College of Pharmacy and Science offered a plan to the War Production Board at Washington whereby it proposed to solicit donations of quinine and kindred compounds from its alumni.

The offer was gladly accepted, and the College was authorized to proceed.

Later the War Production Board asked, in the interest of a clinical experiment, that the campaign include all of Pennsylvania. To this request the College gladly acceded.

By many means of publicity, pharmacists, hospitals, etc., were solicited. The College sent out special letters and bulletins, salesmen of pharmaceutical houses and some wholesalers solicited donations, the pharmaceutical press in Pennsylvania did its customary good job, and the War Production Board itself sent letters to every Pennsylvania pharmacist asking for cooperation in this worthy enterprise.

Soon, donations began to pour into the College, and up to the time of this writing, this is what the College has done:

In addition to arranging the campaign, it has received from almost one thousand donors approximately eleven thousand unit packages of quinine compounds, pills, capsules, salts, etc. It has pooled all of these, it has recorded every donation carefully, and each has been acknowedged, providing the sender left a name and address. In the pool now, there is somewhere between six and eight thousand ounces of compounds of quinine. All of this material will ultimately be converted into the sulphate or hydrochloride of the particular alkaloid, and transferred to Washington. There will also be sent to War Production Board a complete record of all donors and all donations.

To the eternal credit of those druggists, hospitals, physicians and others who were kind enough and patriotic enough to make this marvelous contribution, it can be said that the packaging was well done, generally, and that the contents in terms of quinine compounds,

were clean and in good shape. But enough has not been done in Pennsylvania. Pennsylvania has *not* spoken as Pennsylvania usually does, for only one druggist out of four has made a contribution, which is not altogether as it should be.

The War Production Board will again send a letter to every druggist in Pennsylvania, and then from Washington, using the Pennsylvania experiment as a guidepost, the pharmacists and hospitals of the whole United States will be asked to do what Pennsylvania pharmacy has done. If every State in the Union could conceivably do as much or more than has been done and will be done in Pennsylvania, the gift of pharmacy, a real contribution of pharmacy to the war effort, would mean enough quinine to sustain an Army of 100,000 or more free from malaria, in the jungles and tangles and bogs and marshes out there on the tropical front where our boys are fighting our battles for us.

Any pharmacist or other quinine donor reading this item who has not made a contribution to this cause should at once examine his stocks and see just how he can help. The Quinine Pool, established at the Philadelphia College of Pharmacy and Science, will be delighted to continue in its efforts to collect from Pennsylvania sources, or elsewhere, every available grain of this important material. Send any form—pill, capsule, or powder, or any of the salts of quinine, quinidine, cinchonine, or cinchonidine, to the Quinine Pool, Philadelphia College of Pharmacy and Science, 43rd and Kingsessing Avenue, Philadelphia.

ANNOUNCEMENT OF THE KILMER PRIZE

Dr. Frederick B. Kilmer bequeathed to the American Pharmaceutical Association the sum of Three Thousand Dollars to be held in trust, the income to be applied to the awarding of a prize to be known as "The Kilmer Prize" for meritorious work in pharmacognosy, preference to be given to studies in vegetable drugs. The purpose of the prize is to encourage students in pharmaceutical educational institutions to assume an active interest in research in pharmacognosy.

The Chairman of the Kilmer Prize Committee of the A. Ph. A. hereby announces the offering of the Kilmer Prize by the Scientific Section, the award to be made during the annual meeting of the Association at Providence, R. I., August, 1943.

Rules of Eligibility

(1) The author of a paper on some phase of pharmacognosy, who is a member of the last graduating class of any college or school of pharmacy, prior to the annual meeting of the Association, is eligible for the award. Candidates for advanced degrees are not eligible. Accordingly, students entering into competition for this prize must be members of the present senior class of a college or school of pharmacy.

(2) Papers eligible for the award must be the result of the student's own work, and may be based upon either laboratory or library research or both. They must be written during the last year of the candidate's course in pharmacy and must be submitted in triplicate.

(3) The head of the Pharmacognosy Department in each school or college shall select the one to three best papers submitted by the graduating class of his own school.

(4) Each school or college is privileged to send these papers to the Secretary of the Association, and in order to be entered for the 1943 award, they must be received by the Secretary not later than June 1, 1943. The papers submitted must not reveal the identity of the school nor of any of the teachers connected therewith. A sealed envelope containing the summer address of the author and a certified statement from an officer of the institution that the contestant is a full-fledged senior and candidate for graduation not later than June, 1943 must accompany each paper.

(5) The Kilmer Prize Committee will select the winner from the papers submitted and the winner will be notified about two weeks prior to the date of the meeting in Providence to enable him or her to make plans for attending it.

(6) If the Committee finds no paper sufficiently meritorious, no award will be made.

The Kilmer Prize consists of a gold key, suitably inscribed. The difference between the cost of the prize and the annual income from Dr. Kilmer's bequest, about $60.00, will be sent the winner to assist in attending the meeting of the Association to receive the award.

J. Allen Reese, *Chairman.* E. F. Kelly, *Secretary.*

U. S. CIVIL SERVICE OPENS NEW EXAMINATION FOR PHARMACISTS

Pharmacists interested in entering the Federal service should note the new U. S. Civil Service examination for Junior Pharmacist, $2,000 a year.

Applications must be filed with the Commission's Washington office by December 15, 1942.

Junior Pharmacists in the Federal service have charge of pharmaceutical work in hospitals or dispensaries, compound doctors' prescriptions, manufacture U. S. P. and N. F. preparations, and perform related work. Positions are located throughout the United States.

Applicants taking the written test for these jobs need to show either 4 years of appropriate college study in pharmacy, or 4 years of pharmaceutical experience as registered pharmacists compounding doctor's prescriptions, or some appropriate combination of education and experience.

There are no age limits for the examination.

Applications are not desired from war workers unless higher skills would be utilized in a change of position. War Manpower restrictions on Federal appointment of persons engaged in certain critical occupations in specified areas are set forth in Form 3989, posted in first- and second-class post offices.

Full information as to requirements as well as forms for applying may be obtained at first- or second-class post offices, or from the United States Civil Service Commission in Washington, D. C.

SOLID EXTRACTS

Abbreviated Notes of Scientific Interest

By the scientific use of color it is practical to increase the illumination from most light systems 100% without any change in lighting equipment or any increase in wattage, according to a report made at a recent conference of the National Illuminating Society.

The steps that should be taken to achieve such a saving in light were outlined as follows: refinish the ceiling with a high-grade white or light ivory paint, preferably one having an eggshell or matte finish; refinish the side walls with a slightly darker paint, such as light green, with 65% reflection; refinish all horizontal surfaces in a paint of at least 40% reflection; and give all machines a standard "three-dimensional" finish, spotlighting the working area with light-colored paints of contrasting hues.

AJP

The Council on Foods and Nutrition of the American Medical Association has recently recommended the restriction of sugar in such products as sweetened carbonated beverages and forms of candy which are low in nutritional value. Candy consumption in this country is about 16 pounds per person a year and in 1939 over 18,000,000,000 bottles of soft-drinks were consumed with about a 20-30 per cent. increase since 1939. The Council contends that the benefits to health from sugar rationing will be greater if, in rationing, priority is given to the use of sugar as a sweetening agent for more nutritious foods such as bread and dairy products, where sweetening makes them more appetizing, and for preserving or flavoring other foods as in canning.

Official rulings as yet have not taken nutritional levels into consideration in the allocation of sugar.

AJP

Malaria probably affects as many as 800,000,000 people annually. The quinine shortage has given impetus to the manufacture of a synthetic antimalarial known as atabrine. The drug was, until 1941, entirely prepared from intermediates imported from Germany. In 1941 American chemists solved the problem of synthesizing the drug through intricate steps. Conclusive tests have shown American made atabrine identical with German, proving that American chemists in this war are not inferior to the Germans as in the last.

Sulfadiazine in the form of a 2.5 per cent. aqueous solution solubilized by 8 per cent. triethanolamine was tried on a series of cases classified as second and third degree burns. The solution was applied by spraying on the surface every hour on the first day, every two hours on the second, every three hours the third and every four hours the fourth. The wound was dried by fanning or with warm air after each application. No reactions from the drug were observed and the eschar is such that it may be thus applied without irritation or constriction about the face, mouth or joints. Good results were obtained.

AJP

Wartime rationing of imported cane sugar, with which we have catered to our "sweet tooth" for so long, has made us think again of that more or less neglected product, beet sugar. It was in Philadelphia, in 1830, that James Ronaldson made the first serious effort to establish a beet sugar industry in America. Later, he and some others formulated the Beet Sugar Society of Philadelphia, hiring an expert to go to France to study that country's production methods. However, it was not until 1870 that the first successful beet sugar factory was established in the United States, the pioneer plant being in California.

AJP

The War Production Board put its "tube for a tube" edict into effect on April 1, 1942. From that date until September 30, 1,168,000 pounds of metal tubes have been turned back in this manner, representing 513,920 pounds of tin. Of this, 260,000 pounds have been reclaimed for industrial use in the war industries, and the monthly reclamation has now achieved the total of 160,000 pounds per month.

AJP

A recently prepared brochure on the Cascara Tree in British Columbia indicates that the average yield of bark per tree is ten pounds, and that for every ton of bark 200 trees must be killed. Therefore, to supply the average annual requirements of Cascara, 300,000 trees are destroyed each year, making quite understandable the fact that the resources of our own States of Oregon and Washington, and, lately, British Columbia in Canada, have become rapidly depleted in the past 65 years.

BOOK REVIEWS

An Introduction to Materia Medica and Pharmacology. By Hugh Alister McGuigan, Ph. D., M. D., and Elsie E. Krug, R. N. Second Edition, 779 pages, 1942. C. V. Mosby Co., St. Louis, Mo.

This book is primarily intended for students of nursing. The material has all been rearranged to facilitate the finding of information and to provide for the study of drugs in relation to the disease conditions for which they are given. With the changes in the field of therapeutics the nurse has a new responsibility and needs to know more about nursing than she did a decade ago.

The nurse's work includes drug administration to patients, and the use of various solutions and antiseptics in hospital routines. It is not her duty to diagnose or prescribe but she should have accurate knowledge of the action, dosage and for what condition drugs are administered.

The most important or useful drugs have been stressed and the less important ones either deleted or briefly mentioned.

M. O. HOLLAND.

The Conquest of Bacteria. By F. Sherwood Taylor. 178 pages, 1942. Philosophical Library and Alliance Book Corporation, New York.

This volume contains the story of the chemical discoveries which conquered disease. It has been written by one of England's most eminent scientists.

It is a concise account of the chemotherapeutic treatment of disease although somewhat elemental in nature. First, there is a brief discussion of the bacterial origin of disease followed by the historical and chemical development of the drugs and the rise of chemotherapy to prominence.

There is included a table of sulfonamide drugs as they were in 1940. Naturally, there is much to be added.

M. O. HOLLAND.

Reports of the Progress of Applied Chemistry. Issued by the Society of Chemical Industry. 545 pages, 1941. London, England.

The current reports of the progress of Applied Chemistry are quite extensive in their scope. The leading authorities in each field have been called upon to summarize the current material. Although published in Britain, the summaries include new developments in the other nations as well.

The subjects covered include:

General, Plant, and Machinery;
Fuel;
Gas, Destructive Distillation, Tar, and Tar Products;
Mineral Oils;
Intermediates and Coloring Matters;
Fibres, Textiles, and Cellulose,
The Protein Fibres,
Cellulose Textile Chemistry;
Pulp and Paper;
Acids, Alkalis, Salts, Etc.;
Glass;
Ceramics, Refractories and Cements;
Iron and Steel;
Non-Ferrous Metals;
Electrochemical and Electrometallurgical Industries;
Fats, Fatty Oils, and Detergents;
Plastics;
Resins, Drying Oils, Varnishes and Paints;
Rubber;
Leather;
Soils and Fertilisers;
Sugars and Starches;
The Fermentation Industries;
Foods;
Fine Chemicals and Medicinal Substances;
Essential Oils, Isolates, Derivatives and Synthetics;
Photographic Material and Processes;
Sanitation and Water Purification.

M. O. HOLLAND.

Science in War. Popular Science Volume XIV. Philadelphia College of Pharmacy and Science, 1942. Price: $1.00.

Each year, for almost two decades, the members of the Faculty of the Philadelphia College of Pharmacy and Science have delivered a series of talks for the general public. These lectures, on varying topics, have been specially designed to be complete in scientific detail, yet in words and terms understandable to all. The 1942 lecture series was based on the theme of "Science in War."

The series, complete in all details, and amply illustrated, comprises this latest addition to the Popular Science Volumes. Seven chapters present the role of physics, chemistry, bacteriology, medicine and pharmacy in the war, and the need for and application of conservation programs. Complete perusal of this 100-page book will give the reader a much better and clearer understanding of the conduct of war. Also included is the complete OCD chart on chemical warfare agents.

Civilian defense workers, air raid wardens, and all others interested in the progress of the present world conflict will find much of value within the book's covers.

JOHN E. KRAMER.

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